

## **REMARKS/ARGUMENTS**

The Applicants have carefully considered this application in connection with the Examiner's Action and respectfully request reconsideration of this application in view of the foregoing amendment and the following remarks.

The Applicants originally submitted Claims 1-15 in the application. In this response, the Applicants amend Claims 1-7 and 11-13, and cancel claims 8-10, 14 and 15 without prejudice or disclaimer. Additionally, the Applicants amend the title. Accordingly, Claims 1-7, and 11-13 are currently pending in the Application.

The Applicants also submit herewith an affidavit of Christi K. Madsen, who is an expert in integrated optics and optical filters. The affidavit is evidence in support of the assertions made herein and thus is not merely an attorney argument.

### **I. Remarks Regarding Technical Aspects of All-Pass Optical Filters and the Fabry-Perot Interferometer**

In the prior Office Actions, the Examiner asserted that a Fabry-Perot (FP) interferometer is an all-pass optical filter (APOF), or in the alternative, that an FP interferometer can be configured as an APOF. In the Applicants' submission filed November 17, 2004, the Applicants presented a detailed technical rebuttal to the Examiner's position, elements of which were overlooked by the Examiner. In this section of this response, the Applicants consolidate their past comments distinguishing an FP interferometer from an APOF, and additionally provide herewith an affidavit by Christi Madsen in support of the following comments. The Applicants respectfully request that

the Examiner specifically support any rebuttal of these technical comments and the following arguments with specific citations to evidence. Following this section, the Applicants' responses to the Examiner's rejection of the Claims are presented.

A transmissive FP interferometer is not an all-pass optical filter. Madsen aff. ¶ 8. All-pass filters are a class of filters for which the magnitude of the frequency response  $H(\omega)$  of the filter is substantially constant over a range of frequency. In such filters, the phase of the frequency response can, however, vary with the frequency. See G. Lenz and C. K. Madsen, General Optical All-Pass Filter Structures for Dispersion Control in WDM Systems, *J. Lightwave Tech.*, vol. 17, 1999, 1248. An APOF produces a time delay response for optical signals at specific frequencies, resulting in a time delay spectrum, with time delay peaks separated by a Free Spectral Range (FSR). See Gadi Lenz, et al., Optical Delay Lines Based on Optical Filters, *IEEE Journal of Quantum Electronics*, vol. 37, 2001, 525, 531.

A transmissive FP interferometer comprises two partially reflective surfaces separated by a slab-like region of empty space or dielectric. See C. Fabry and A. Perot, Théorie et Applications d'une Nouvelle Méthode de Spectroscopie interférentielle, 16 Ann. Chim. Phys. 115 (1899). The FP is characterized by a magnitude of the frequency response that is *periodic* over a range of frequency. See, e.g., Leonard J. Cimini, et al., Optical Equalization to Combat the Effects of Laser Chirp and Fiber Dispersion, 8 *Journal of Lightwave Technology* 649, 652 (1990). The magnitude of the frequency response of an FP has a series of peaks in the frequency domain. See id. Since the magnitude of the frequency response of an FP is not substantially constant in frequency, an FP does not possess the characteristics of an all-pass optical filter. Therefore, a transmissive Fabry-Perot interferometer is not an APOF.

## **II. Rejection of Claims 1-15 for Obviousness-Type Double Patenting**

The Examiner has rejected Claims 1-15 under the judicially created doctrine of obviousness-type double patenting over claims 1-18 of U.S. Patent No. 6,289,151 to Kazarinov, *et al.*, (“Kazarinov”) in view of Harvey, *et al.*, Optics Letters, Vol. 18, No. 2, Jan. 15, 1993, pp. 107-109 (“Harvey”). The Applicants respectfully traverse the rejection for the reasons set forth below.

Kazarinov teaches an all-pass optical filter (AEOF) design employing at least one feedback path, and the generic elements of such a filter, including an input port, output port and a splitter/combiner. However, Kazarinov is silent with respect to a signal source configured to provide an input optical pulse train having a regular repetition rate, and matching a free spectral range of the AEOF to said regular repetition rate as recited in amended Claim 1. The Examiner looks to Harvey, which teaches a transmissive Fabry-Perot filter, to cure the deficiencies of Kazarinov, but relies on the mistaken assertion that a transmissive Fabry-Perot filter is an AEOF, or in the alternative, can be used as an AEOF.

Regarding the rejection of independent Claim 1, as set forth above, a transmissive FP is not an AEOF. Furthermore, a transmissive FP cannot be used as an AEOF, because frequencies not centered on the transmission peaks of the FP are attenuated. Madsen aff. ¶ 9. Moreover, modification of Harvey’s transmissive FP filter to achieve all-pass characteristics is not taught or suggested by Harvey, and Harvey does not contain any motivation to do so. Indeed, Harvey teaches away from such a modification, as Harvey *relies* on the amplitude-filtering characteristics of the transmissive FP filter. Harvey employs a feedback system to actively control the ring length of the disclosed ring laser to stabilize the laser output. See Harvey at 108, column 1, ¶¶ 2, 3. The operation of the feedback system relies on the property that the amplitude of the frequency response varies with

frequency. *Id.*; Harvey FIG. 2. If the Examiner is suggesting that it would be obvious to *modify* the FP filter to create an all-pass filter, the Applicants respectfully disagree. Such a modification would require creating a reflective FP. Madsen aff. ¶ 8. But the amplitude of the frequency response of a reflective FP does not vary with frequency, so Harvey's feedback system would be inoperable if a reflective FP were used. *Id.* Moreover, a reflective FP would block the optical path of the ring laser, thus destroying the conditions required to lase and rendering the laser inoperable. *Id.* ¶¶ 8, 9. Thus, the combination of Kazarinov and Harvey is improper, and fails to support the Examiner's rejection for judicially created doctrine of obviousness-type double patenting.

The Examiner also looks to Harvey to supply the teaching of creating a plurality of time delay peaks synchronized with the repetition rate of an input signal. But Harvey does not teach time delay peaks—instead, Harvey teaches *transmission intensity* peaks. *Id.* ¶ 7. Harvey neither mentions nor relies on a time delay spectrum. See Harvey; Madsen aff. ¶ 6. Because Harvey is silent regarding a time delay spectrum, and because the stabilization method does not derive any utility from a time delay spectrum, Harvey provides no suggestion or motivation for the use of time delay peaks in any manner. Furthermore, as set forth above, the teaching suggested by the Examiner is incompatible with the system described in Harvey.

Because Harvey's feedback scheme would be inoperable using a time delay spectrum, and because there is no teaching of the use of a time delay spectrum, Harvey fails to supply the missing teaching to render the present Application obvious under the judicially created doctrine of obviousness-type double patenting. Therefore, independent Claims 1 and 11, and claims depending thereon, are not unpatentable in view of Harvey. Accordingly, the Applicants

respectfully request that the Examiner remove the rejection of Claims 1-7 and 11-13, and allow issuance thereof.

### **III. Rejection of Claims 1-10 and 14 under 35 U.S.C. § 103(a)**

The Examiner has rejected Claims 1-10 and 14 as being unpatentable over Harvey with modifications asserted to be obvious by the Examiner. The Applicants have canceled Claims 8-10 and 14, so the Examiner's rejection of these claims is not addressed.

Specifically, the Examiner asserts that Harvey teaches all the elements of independent Claim 1, including an all-pass optical filter, except for a feedback path in which the all-pass optical filter is configured to apply a time delay spectrum to an optical signal. The Examiner then asserts that Harvey teaches a feedforward design, and that a person having ordinary skill in the art would recognize that a feedback design could be used instead, and that such a person would be motivated to combine the teaching of Harvey with a feedback design. The Applicants respectfully disagree.

First, Harvey does not teach an all-pass optical filter (APOF). As set forth above, Harvey teaches a transmissive Fabry-Perot (FP) filter, which is not an APOF. Madsen aff. ¶ 8. As further set forth above, the transmissive FP filter is not used in Harvey to induce a time delay on an optical signal. Id. ¶¶ 6, 7. Moreover, one of ordinary skill in the art would not select a transmissive Fabry-Perot etalon to induce a time delay on such a signal. Id. ¶¶ 9, 10. Furthermore, it would not be obvious to one having ordinary skill in the art to modify the transmissive Fabry-Perot etalon taught by Harvey to be reflective to produce the characteristics of an all-pass optical filter. In particular, doing so would block the optical path of the ring laser, destroying the lasing conditions. Id. ¶ 8.

Thus, without additional elements in the ring laser system, which are neither taught nor suggested by Harvey, such a modification would destroy the functionality of Harvey's ring laser. *Id.*

The Applicants also disagree with the Examiner's assertion that the feedback system employed by Harvey renders obvious the feedback recited in Claim 1. In particular, while a feedback path of an APOF is an element of pending Claim 1, the feedback in Harvey cited by the Examiner is not an element of Harvey's FP, which is not an APOF, but is instead *derived from the output* of Harvey's FP. Assuming for the sake of argument that Harvey's FP is an APOF, while maintaining that it is not, the feedback path taught by Harvey is between the output of the filter and the elements used to control the laser ring length. See Harvey, FIG. 1; see id. at 108. Thus, Harvey's feedback path cannot be properly construed to be an element of the filter, as recited in Claim 1. Moreover, as further recited in Claim 1, the feedback in the present invention acts to apply a plurality of time delay periods to an optical signal. But even if Harvey's feedback could be properly construed to be an element of the filter, while maintaining that it cannot, it does not apply a plurality of time delay periods to an optical signal as recited in Claim 1, but instead controls the *ring length* of the ring laser. Id. at 108 ("We have alternatively used both fiber heating and piezoelectrically activated mirror movement to effect the necessary active control of ring length.")

Because Harvey does not teach an APOF, the feedback taught by Harvey is not a feedback path of an all-pass optical filter, and the feedback path is not configured to apply a time delay spectrum to an optical pulse train, Harvey, as modified by the Examiner, does not teach or suggest all the claim limitations of Claim 1. Furthermore, because the modification to Harvey would not result in the functionality of the presently claimed invention, there is no reasonable likelihood of success whatsoever. Accordingly, the Examiner's arguments do not support a *prima facie* case of

obviousness of independent Claim 1 over Harvey, as modified, and the claim is allowable. Claims 2-7, which depend directly or indirectly from Claim 1, are then also allowable. The Applicants respectfully request that the Examiner remove the rejection of Claims 1-7 under 35 U.S.C. §103(a), and allow issuance thereof.

**IV. Rejection of Claims 11-13 under 35 U.S.C. § 102(b)**

The Examiner has rejected Claims 11-13 under 35 U.S.C. § 102(b) as being anticipated by Harvey. Independent Claim 11 includes the element of an all-pass optical filter (APOF). As set forth above, and in Madsen aff. ¶ 8, a transmissive FP is not an APOF. Therefore, the Applicants respectfully request that the Examiner withdraw the rejection of independent Claim 11, and Claims 12-13, which depend thereon and allow issuance thereof.

**V. Conclusion**

In view of the foregoing amendments and remarks, the Applicants now view all of the Claims currently pending in this application to be in condition for allowance and therefore earnestly solicit a Notice of Allowance for Claims 1-7, and 11-13.

The Applicants request the Examiner to telephone the undersigned attorney of record at (972) 480-8800 if such would further or expedite the prosecution of the present application.

Respectfully submitted,

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